General Types and Suitability of Models

Accuracy/Usefulness of Models

- Necessarily abstract from reality: a tradeoff between realism and tractability
- Precision does not mean accuracy
- Experience of building a model (i.e., mathematically formalizing causality in a system) can provide new and useful insights
- Most useful for comparing scenarios
- Results won’t be “right” but can be useful

Model Sophistication

- Single driver vs multiple driver models
  - Single driver as a proxy
  - Independence of drivers
- Static vs dynamic (i.e., simulation) models
  - Single & multiple period causal links
  - Prescriptive vs. non-prescriptive models
- Single aspect vs multiple aspect models
  - Linked modeling frameworks
  - Fully integrated models
- Partial vs full system models

Multiple Aspect System Models

- Advantages
  - Analyses of scenarios affecting water supply reliability "automatically" generate economic impacts, for example
  - Both local and system wide impacts can be evaluated
  - Both synergistic and mutually conflicting interactions between options can be captured
- Disadvantages
  - Data needs are very high
  - Conforming data to use with other models is problematic
  - Iterating between models not dynamically linked can be difficult and time consuming

Regional Modeling Feasibility

- Availability of data
  - Time series water supply data
  - Water year type water supply data
  - Time series water use data
  - Reliability benefits
  - Cost of water management options
- Availability of water management models
  - Reservoir operations
  - Groundwater management

Update 2003
Modeling Framework
Straw Proposal

Principles

- Best available forecasting tools supported by the available data
- Modeling approach for the same study area similar to that used for the CALFED Water Management Strategy Program
- Coordination with CALFED and other planning processes
  - Consistency of assumptions
  - Coordination of efforts
  - Increased stakeholder involvement

Modeling Tools

Institute for Water Resources Municipal and Industrial Needs Model (IWR-MAIN)

- Model Input
  - Population data
  - Per capita use
  - Housing characteristics
  - Employment
  - Economic data (income, water price, water cost)
  - Weather
  - Cost, efficiency, saturation, and intensity by end use for conservation programs
- Model Output
  - Water use forecast
  - Water use reduction due to conservation programs
  - Comparison of avoided water cost to cost of conservation programs

California Agricultural Model (CALAG)

- Model Input
  - Cost and availability of water by source and region
  - Yields, water use, and costs of production by crop and region
  - Irrigation efficiency cost function parameters
  - Land suitability by region
  - Crop market demand
- Model Output
  - Water use by region
  - Crop pattern by region
  - Farm income by region

California Simulation Model (CALSIM II)

Model Input

- Capacity of physical infrastructure
- Surface and groundwater inflow hydrology
- Parameterization of groundwater hydrogeology
- Agricultural and urban demands
- Efficiencies, losses, return flows
- Regulatory and legal constraints
- Contractual demands
- Environmental demands
- Reservoir operating rules
- Water allocation priorities

Model Output

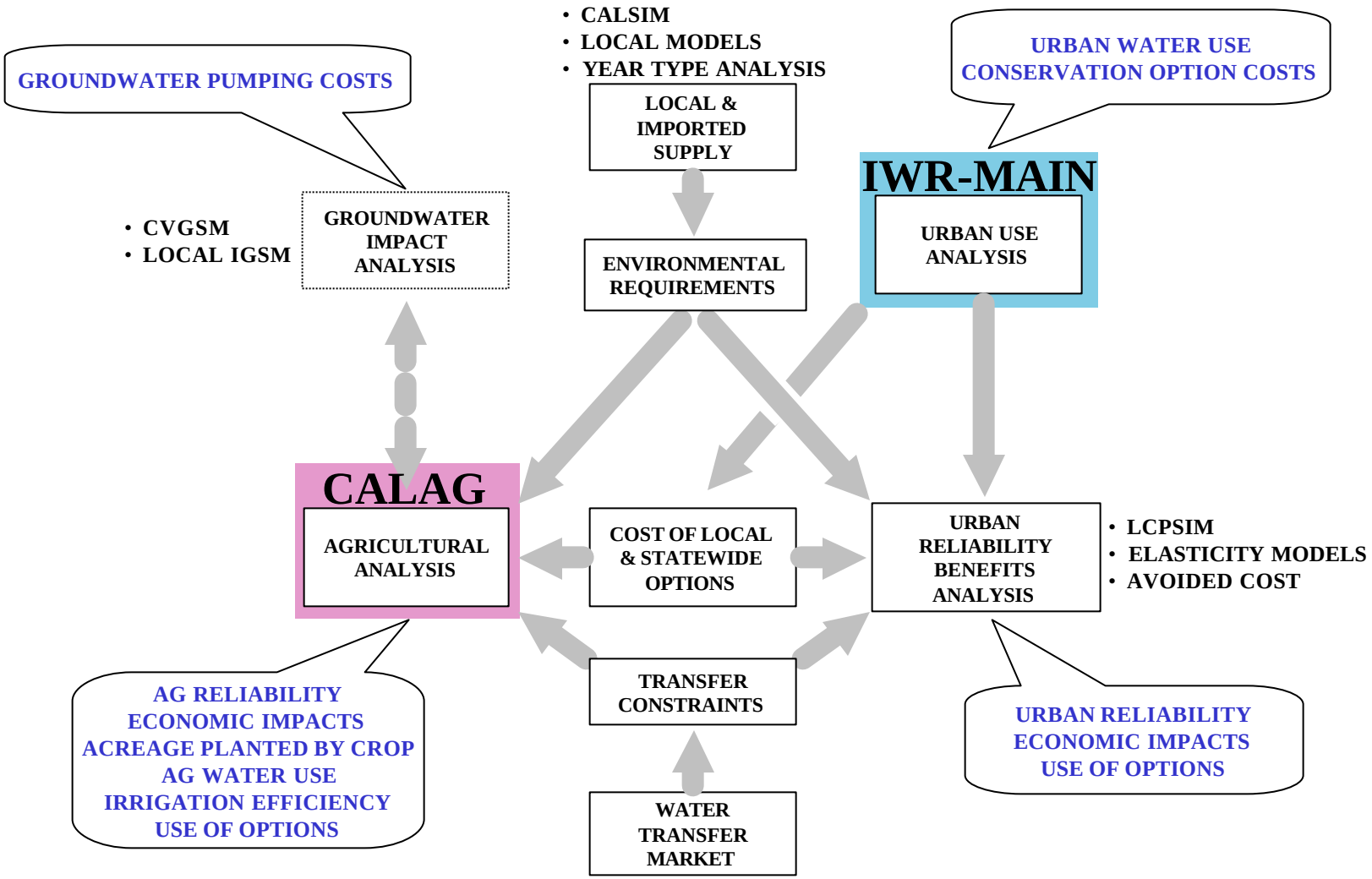
Monthly time series of flows and storages at specific locations:

- Reservoir levels
- Stream and channel flows
- SWP deliveries
- CVP deliveries
- Non-project deliveries
- Refuge Deliveries
- Delta Outflow
- Delta Export
- Groundwater Pumping

Least-Cost Planning Simulation Model (LCPSIM)

- Model Input
  - Regional annual supply sequence by source
  - Regional annual demand sequence
  - Local carryover storage capacity and use priority
  - Shortage loss function (WTP to avoid shortages)
  - Cost of local water management options, including transfers
- Model Output
  - Least-cost use of local options
    - At desired level of reliability (cost effective solution)
    - At economically efficient use of local options (overall least-cost)
  - Overall expected costs and losses of reliability management
  - Benefits of imported supplies

Modeling Framework
56 Planning Areas

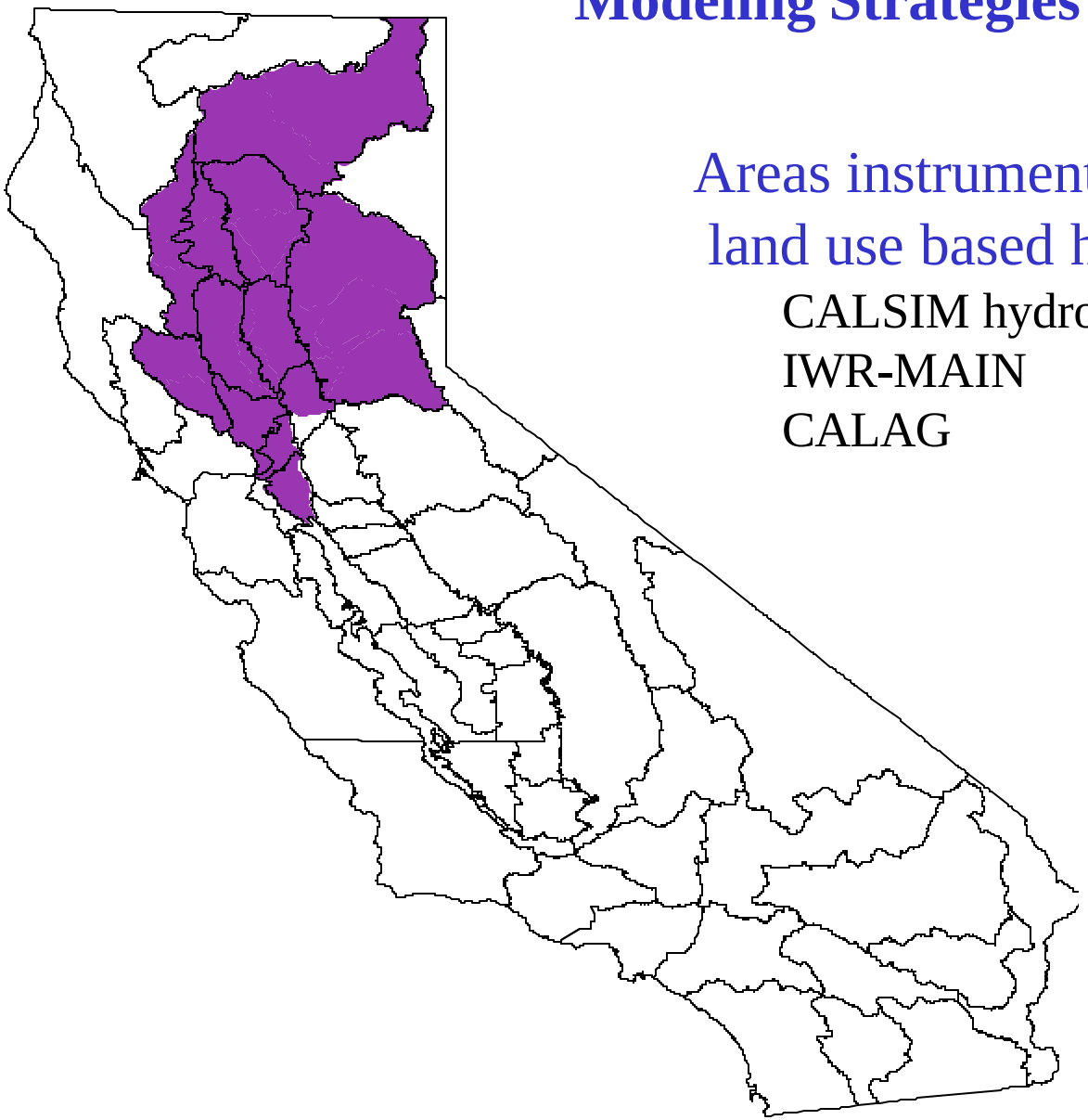


Update 2001 Planning Areas
Modeling Strategies

Statewide

- IWR-MAIN
- CALAG
- Local agency studies

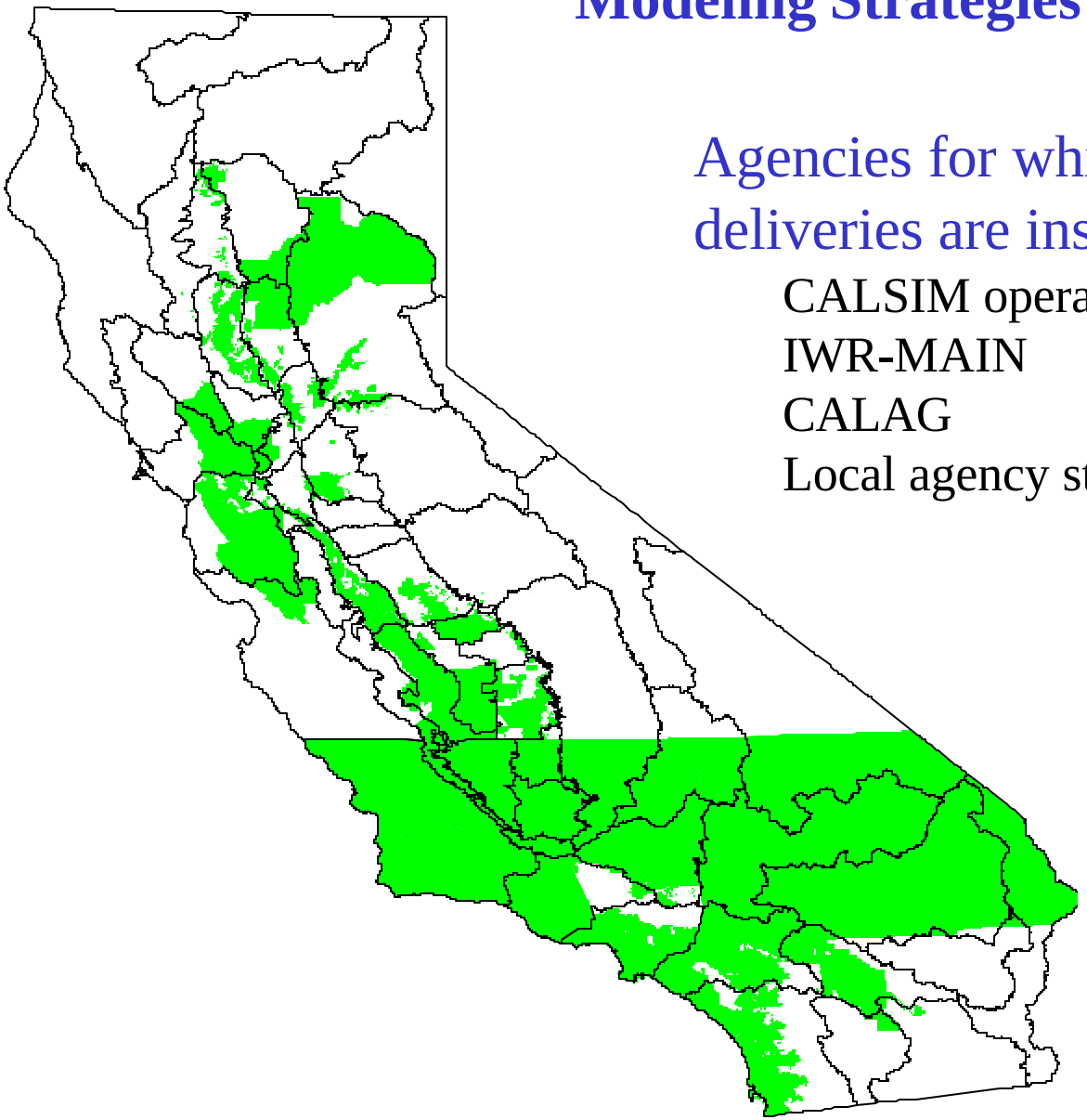
Update 2001 Planning Areas
Modeling Strategies



Areas instrumental to CALSIM land use based hydrology

- CALSIM hydrology modeling
- IWR-MAIN
- CALAG

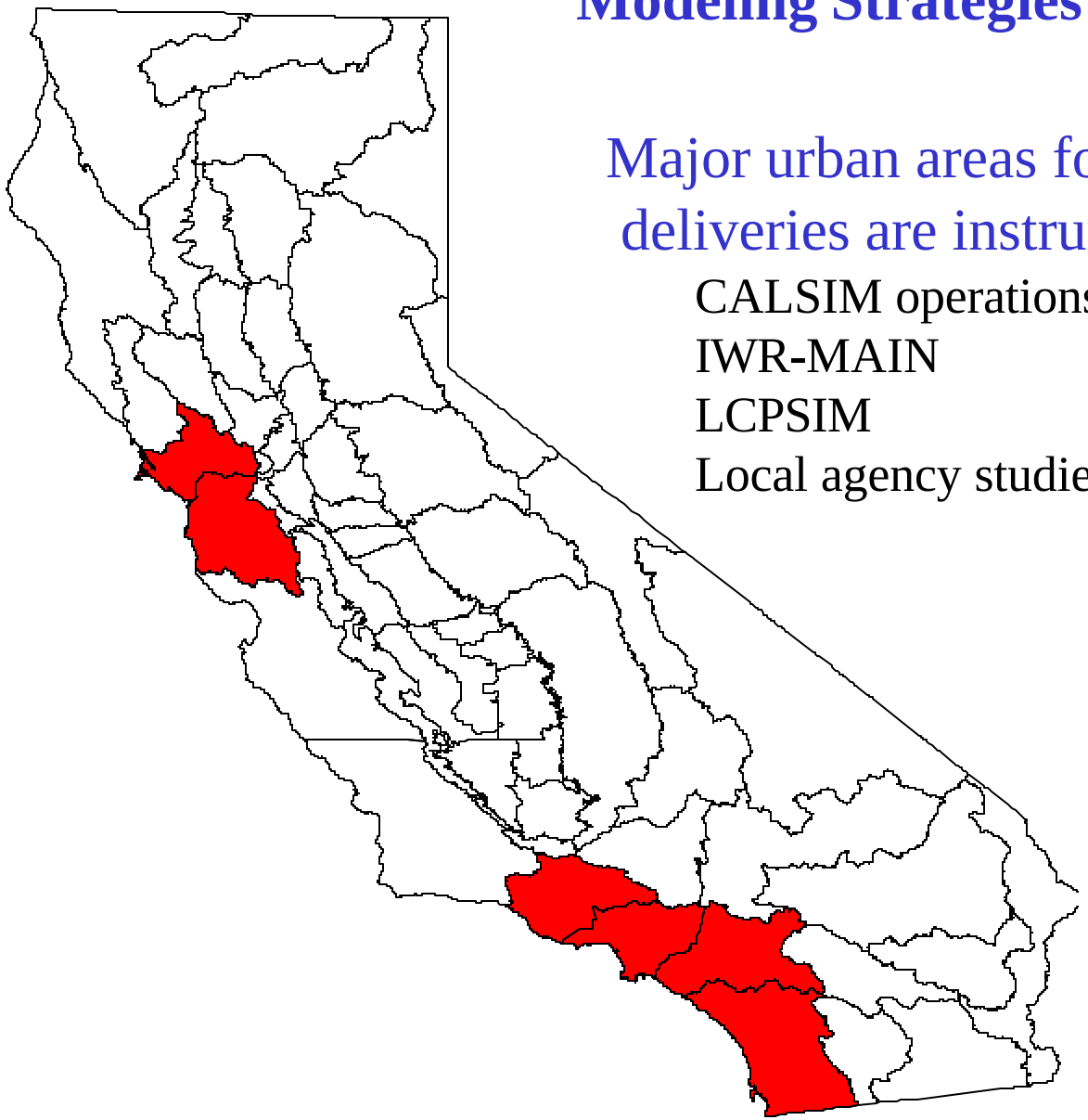
Update 2001 Planning Areas
Modeling Strategies



Agencies for which CALSIM deliveries are instrumental

- CALSIM operations modeling
- IWR-MAIN
- CALAG
- Local agency studies

Update 2001 Planning Areas
Modeling Strategies



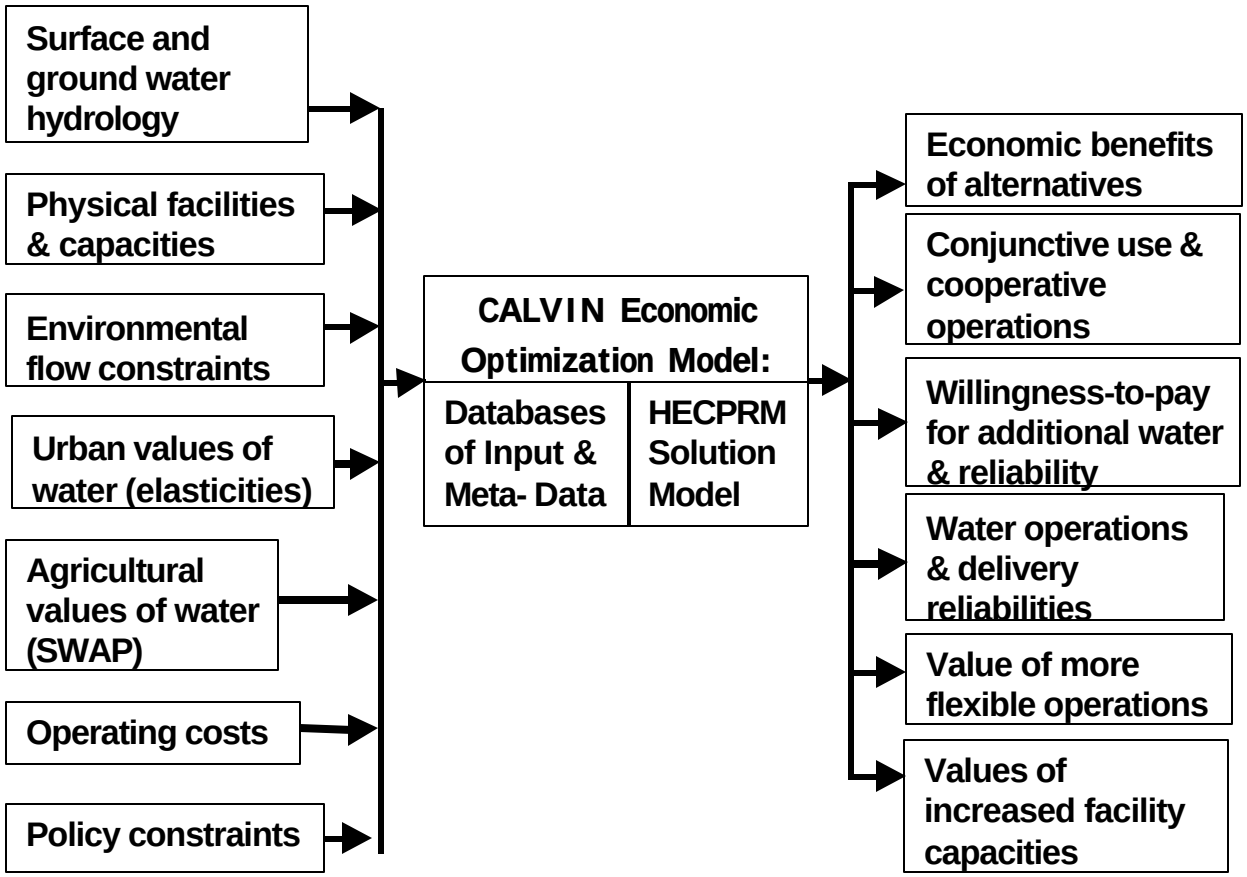
Major urban areas for which CALSIM deliveries are instrumental

- CALSIM operations modeling
- IWR-MAIN
- LCPSIM
- Local agency studies

CWPU & CALVIN

- Role of CALVIN in the California Water Plan Update 2003
  - Discussion of model capabilities (inputs and outputs)
  - Discussion of current CALVIN modeling work
    - CALFED report
    - California Energy Commission climate change research
  - Consider using results of existing CALVIN studies as reconnaissance level information for creating study plans
- Work needed to use CALVIN for future California Water Plan Updates
  - Address hydrologic and demand data problems
  - Reconcile data and hydrology with other modeling tools
  - Develop data management system
  - Train staff in model use

Data Flow for the CALVIN Model



CALVIN's Demand Coverage